

CLAIMS

What is claimed is:

1. A lamination for a motor stator, comprising:
5 a central aperture configured to receive a rotor;
a plurality of slots disposed concentrically about the central aperture for receiving a plurality of stator windings;
an outer periphery defining a generally square cross section having chamfered corners; and
10 a plurality of convective cooling ducts disposed between the slots and the outer periphery and extending longitudinally between ends of the lamination, the cooling ducts including at least one center duct disposed about vertical and horizontal centerlines of the frame, and at least one corner duct disposed in each of the chamfered corners between the center ducts.
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2. The lamination as recited in claim 1, wherein the corner ducts include at least one fin for increasing a convective surface area within the corner ducts.
3. The lamination as recited in claim 1, comprising a plurality of corner ducts
20 disposed in each of the chamfered corners.
4. The lamination as recited in claim 1, wherein the center ducts and the corner ducts are configured to force flow through the center ducts.
5. The lamination as recited in claim 1, wherein the center ducts and the corner
25 ducts are configured to provide forced convective heat transfer from the lamination during operation to reduce overall temperature differentials in the lamination.

6. The lamination as recited in claim 1, wherein the at least one center duct includes a plurality of center ducts disposed at mirror-image locations about the respective vertical and horizontal centerlines of the frame.

5 7. A lamination for a motor stator for use in a motor, comprising:
a central aperture configured to receive a rotor;
a plurality of slots disposed concentrically about the central aperture for receiving a
plurality of stator windings;
an outer periphery defining a generally square cross section having chamfered
10 corners; and
a plurality of convective cooling ducts disposed between the slots and the outer
periphery and extending longitudinally between ends of the lamination, the cooling ducts
including at least one center duct disposed about vertical and horizontal centerlines of the
frame, and at least one corner duct disposed in each of the chamfered corners between the
15 center ducts, each of the corner ducts including at least one fin for increasing a convective
surface area within the corner ducts;
wherein the center ducts and the corner ducts are configured to force flow through
the center ducts.

20 8. The lamination as recited in claim 7, wherein each chamfered corner
comprises at least four corner ducts.

 9. The lamination as recited in claim 8, wherein the at least four corner ducts
are arranged in a mirror-image configuration.
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 10. The laminate as recited in claim 7, wherein the center ducts and the corner
ducts are configured to force flow through the center ducts.

11. The lamination as recited in claim 7, wherein the fins are configured to balance flow through the cooling ducts to reduce overall temperature differentials in the lamination during operation of the motor.

5 12. The lamination as recited in claim 7, wherein the center ducts and the corner ducts are configured to provide forced convective heat transfer from the lamination to reduce overall temperature differentials in the lamination during operation of the motor.

10 13. A motor comprising:
a laminate frame comprising a central aperture, a plurality of slots disposed concentrically about the central aperture for receiving a plurality of stator windings, an outer periphery defining a generally square cross section having chamfered corners, and a plurality of convective cooling ducts disposed between the slots and the outer periphery and extending longitudinally between ends of the lamination, the cooling ducts including
15 at least one center duct disposed about vertical and horizontal centerlines of the lamination, and at least one corner duct disposed in each of the chamfered corners between the center ducts;
a rotor disposed in the central aperture of the lamination and supported for rotation therein; and
20 a fan configured to force convective air flow through the cooling ducts during operation.

25 14. The motor as recited in claim 13, wherein a gap is defined between the rotor and an inner periphery of the lamination, and wherein the cooling ducts are configured to force convective air flow through the gap during operation.

15. The motor as recited in claim 13, wherein the rotor includes a plurality of rotor cooling ducts extending longitudinally therethrough, and wherein the cooling ducts are configured to force convective air flow through the rotor cooling ducts during operation.

16. The motor as recited in claim 13, wherein the at least one corner duct includes at least one fin for increasing a convective surface area in the corner duct.

5 17. The motor as recited in claim 13, wherein the at least one center duct includes a plurality of center ducts disposed at mirror-image locations about the respective vertical and horizontal centerlines of the lamination.

18. The motor as recited in 13, wherein the corner ducts and center ducts are configured to force air flow through the center ducts.

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19. A method of manufacturing a lamination for a motor stator, comprising:
forming a plurality of convective cooling ducts between an outer periphery of the lamination defining a generally square cross section having chamfered corners and a central aperture of the lamination, the cooling ducts including at least one center duct disposed
15 about vertical and horizontal centerlines of the lamination, and at least one corner duct disposed in each of the chamfered corners between the center ducts.

20. The method as recited in claim 19, wherein the at least one corner duct includes at least one fin for increasing a convective surface area in the corner duct.

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21. The method as recited in claim 19, wherein the at least one corner duct comprises a plurality of corner ducts disposed in each of the chamfered corners.

22. The method as recited in claim 19, wherein the center ducts include a
25 plurality of center ducts disposed at mirror image locations about the respective vertical and horizontal centerlines of the lamination.

23. A method of cooling a motor comprising a plurality of laminations each having a central aperture configured to receive a rotor and an outer periphery defining a generally square cross section having chamfered corners, comprising:

providing a forced air flow to the laminate motor; and

5 routing the forced air flow through a plurality of convective cooling ducts located between the central aperture and the outer periphery, wherein the cooling ducts comprise at least one center duct disposed about vertical and horizontal centerlines of the lamination, and at least one corner duct disposed in each of the chamfered corners.

10 24. The method as recited in claim 23, wherein routing comprises forcing via the configuration of the center ducts and the corner ducts a portion of the air flow through the center ducts.

15 25. The method as recited in claim 23, wherein routing comprises forcing via the configuration of the center ducts and the corner ducts a portion of the air flow through a plurality of rotor cooling ducts located in the rotor.

26. The method as recited in claim 23, comprising dissipating heat in the air flow via at least one fin disposed in each of the corner ducts.

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27. A method of cooling a motor comprising a plurality of laminations each having a central aperture configured to receive a rotor and an outer periphery defining a generally square cross section, comprising:

providing a forced air flow to the motor;

25 routing the forced air flow through a plurality of convective cooling ducts located between the central aperture and the outer periphery, wherein the cooling ducts comprise at least one center duct disposed about vertical and horizontal centerlines of the lamination, and at least one corner duct disposed in each of the corners; and

forcing via the configuration of the center ducts and the corner ducts a portion of the air flow through the center ducts.

5 28. The method as recited in claim 26, comprising balancing the air flow through the cooling ducts via the fin.

 29. The method as recited in claim 23, comprising balancing the air flow through the cooling ducts via the configuration of the corner ducts and the center ducts.

10 30. The method as recited in claim 29, comprising forcing via the configuration of the center ducts and the corner ducts a portion of the air flow through a plurality of rotor ducts disposed in the rotor.

15 31. The method as recited in claim 29, comprising forcing via the configuration of the center ducts and the corner ducts a portion of the air flow through a gap defined between the rotor and an inner periphery of the frame.

 32. The method as recited in claim 29, comprising balancing the air flow through the cooling ducts via the configuration of the corner ducts and the central ducts.

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 33. The method as recited in claim 32, comprising balancing the air flow through the cooling ducts via at least on fin disposed in at least one of the corner ducts.

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